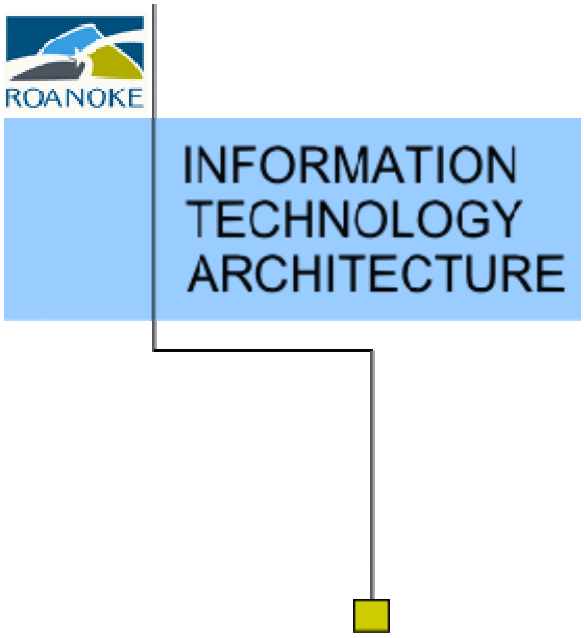

Department of Technology
City of Roanoke, Virginia
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Introduction

The Department of Technology Information Technology division provides information technology services to city departments, constitutional and elected officials, the Western Virginia Water Authority and the public school administrative offices. The information contained in this document identifies the technology architecture and related components required to support business operations and implement new technologies in response to the technology needs of the organization.

Enterprise Architecture is both a foundation by which business solutions are created and a roadmap for the technology of tomorrow. A flexible and robust architecture ensures the effectiveness of technology investments across the organization.

The City of Roanoke's Enterprise Architecture model is based on the Department of Technology's vision statement, specifically:

"To be a strategic leader in delivering quality information and communication services to citizens at work, at home, and in the community by providing exemplary service and by increasing the productivity of government through the progressive use of technology."

Technology Architecture

The City of Roanoke operates a multi-tiered, consolidated architectural model that includes the following layers:

- Application & GIS Architecture
- Platform & Network Architecture
- Internet (E-government) Architecture
- Security Architecture
- Physical Infrastructure
- Telecommunications Architecture (under development)

Application & GIS Architecture

At the center of the city's technology environment lie the application and business systems layer. These systems rely upon the data services environment for the storage and management of information and by the underlying infrastructure services, policies, and procedures for the management of technology. The application architecture consists of a set of presentation services for the client interface, data services for the organization of data, and business services for the application business logic.

Today, the city's application inventory consists of a wide variety of enterprise-wide and department-specific business systems residing on a wide variety of platforms ranging from an Enterprise Server to microcomputers. Over the past few years, the city has been purchasing industry standard client-server solutions with web-enabled functionality to replace and/or integrate to old "legacy" applications. The goal for this layer is to define the application development tools and language environments for a client/server and web-enabled applications. In addition, research of emerging technologies will continue as the city looks for opportunities for advancing technology capabilities.

*Note: the City of Roanoke follows the State of Virginia's guidelines for digital records retention. Information on this guidelines is available at:

http://www.lva.lib.va.us/whatwedo/records/sched_local/index.htm

Office Systems	MS Office Suite (Word, Excel) on PCs attached to a wide-area network and networked Xerox multi-functional devices (print, scan, fax, copy).
Collaborative Software	Lotus Notes for e-mail, calendaring, Intranet portal, collaborate office applications (phone directory, operating procedures etc.,)
Videoconferencing	Lotus Sametime; RevNet for Council webcasting
Business Systems	Roanoke is in the process of replacing many of its financial "legacy" applications as well as acquiring new applications. The majority of these legacy applications utilize CICS with COBOL and VSAM databases. Other systems utilize: • Client-server business solutions (primarily purchased commercial packages) • Integrated, client-server and/or web-enabled solutions • Visual Basic desktop applications • MS Access desktop applications • CL & RPG (AS/400) • COBOL (Enterprise server)
e-gov Systems	• Lotus Notes • Java (Websphere Studio) • Flash, JavaScript, HTML, DHTML • XML • ASP • VB.Net
GIS	• ESRI products – ArcIMS • ArcGIS • ARC/SDE • Visual Basic • Cold Fusion

	• XML
Data Base Management Systems	• Enterprise Server: VSAM • AS/400: DB/400 • MS SQL for client-server applications • DB/2 (Financial applications) • Lotus Notes • MS Access • FoxPro
Interface Methods	• FTP • XML
Reporting Tools	• Crystal Reports • Hummingbird
Help Desk	• Lotus Notes GWI help desk for centralized IT support management

Network Architecture

The network architecture defines the physical components of the infrastructure including the operating systems and equipment used to operate business applications and system-related software. The city's standard network platform architecture includes the Enterprise Server (z/OS), AS/400 and UNIX, file and print servers, application servers, web servers, and desktop workstations.

The City's communications infrastructure includes both voice and data technologies (city-owned PBX phone system) providing citywide access to information technology resources connecting approximately 1,200 computer devices and approximately 1,200 phone sets in over 50 locations.

The Enterprise Wide Area Network (WAN) architecture for Roanoke is configured as a metropolitan area network (MAN) consisting of a fiber backbone running a Sonet-based "optical Ethernet" system integrating voice, video, and data over a high capacity OC-48 link (2.4Gb/sec). This backbone connects the main Operations Center to 11 remote facilities using Nortel OPTera 3500 multi-service platforms with T1 and gigabit Ethernet cards at each location. Two fiber pairs run to each location for redundancy.

The network is configured using 100mb Ethernet with Novell Netware for network authentication and file and print sharing.

The City has numerous remote sites that are connected via VPN over high speed internet and 1 remote site connected via wireless T1. Remote access to enterprise facilities is provided using dial-up internet and VPN for several smaller remote offices.

Servers & Operating Systems

Roanoke hosts a wide variety of operating environments for both application and system-related applications and facilities:

- IBM z/OS enterprise mainframe – running on a Flex ES operating environment with 3270 emulation over TCP/IP connectivity. Currently runs many of the city's financial and enterprise applications.
- AS/400 servers support internal Lotus Notes applications and e-mail services and the Water Utility Billing system.
- Windows servers: over 35 servers running Windows 2000 for a wide variety of applications, e-mail SMTP services, web servers, network management and system utilities.
- Novell NetWare servers -- used for network authentication and file and print sharing.
- Solaris -- supports a regional library system for the Roanoke Valley.
- Linux servers -- provide remote authentication services
- IBM RISC 6000 -- for message switching in the E-911 center
- HP Tandem -- supports the E-911 CAD system

Desktop PCs	DoT centrally manages the procurement and technical support of all desktop PCs throughout the organization to ensure a consistent environment and achieve economies of scale. The city has a PC Replacement Program whereby microcomputers are replaced on a four-year cycle. Network printers and networked Xerox multi-function devices are utilized throughout the organization; stand-alone printers are allowed on an exception-only basis. The technicians and help desk staff use Zenworks to enforce standards, monitor software and hardware inventory and provide remote diagnostics. Currently, the city

	is in the process of converting all remaining Windows NT systems to Windows XP. Current network clients/workstations: 1,200 Operating environment: Windows XP, Windows 2000
Network Servers	Roanoke standard network servers are Novell Netware and Microsoft Windows 2000. File and print services are provided by Novell Netware. In addition, the city also supports Solaris and Unix servers for department specific applications. Servers include: 56 MS Windows servers 5 IBM AIX servers 2 IBM AS/400 servers 2 Novell Netware servers 2 Sun Solaris servers 1 IBM Z/OS enterprise server 1 IBM RISC6000 server Current network supports VLAN technology and private IP addressing.
Network Architecture	Switched 10/100 Ethernet
Network Management	HP Optivity
Enterprise Servers	Roanoke supports many of its major business and legacy applications on an IBM Enterprise server running ZOS on a FLEX box. Enterprise servers include: 1 Enterprise server (ZOS) 3 AS/400 servers (2 for Lotus Notes, 1 for Water Authority systems)
Network Components	• Nortel Optera Metro 3500 Multi-service SONET platform • Nortel Business Policy Switch 2000 • Nortel Passport 8010 Switch • Nortel Contivity 2700 (VPN) • Nortel Contivity 1740 (VPN) • Nortel Alteon FireWall 5114 • Baystack 5510 • Cisco PIX FireWall
DNS servers	External DNS managed by and external ISP; internal name resolution provided by internal DNS and WINS.
Remote Connectivity	Nortel Contivity – VPN servers

Platform Standards

Platform	Standards
DESKTOP	
Operating System	Microsoft Windows 2000 Professional Microsoft Windows XP Professional
Antivirus	Symantec
Web Browser	Internet Explorer 6 or later
File Transfer	
3270 Emulation	IBM 3270
GIS	Arc/Info ArcView ArcSDE
Desktop Diagnostics	Zenworks
PRODUCTIVITY	
Wordprocessor	Microsoft Word 2000 or later
Spreadsheet	Microsoft Excel 2000 or later
Database	Microsoft Access, Lotus Approach, Lotus Notes
Presentation	Microsoft Powerpoint
E-mail client	Lotus Notes
Project Management	Microsoft Project
Reporting	Crystal Reports
Imaging	Laserfiche, WebLink
Handheld devices	Any model with Palm OS (with the exception of Pocket PC for GIS); Pylon software for sync'ing functionality
Videoconferencing	Sametime; RevNet for Council Meetings
SERVERS	
Operating Systems	Microsoft Windows NT/2000 Novell Netware OS/400 z/OS Solaris AIX Nonstop (Tandem)
Application Server	Websphere
Remote Access	VPN – Nortel Contivity
Hardware	Intel IBM RS/6000 (AIX) IBM
Backup	Veritas software
Communications Protocol	TCP/IP
Firewall	Nortel Alteon 5114 and Cisco PIX

Internet Architecture (e-Government)

Since 2000, the City of Roanoke has focused on e-government solutions to improve service delivery to constituents and improve productivity of internal staff. Citizens can now conduct business transactions over the Internet (e.g., apply for a job, pay a bill) at their convenience and from their location. In today's technology environment, citizens and employees can access enterprise data such as Real Estate property information, Police Accident reports, and permit/inspection history without the need to call or visit city hall.

The E-government architecture outlines the technology and guidelines for the public, departments, agencies, and other organizations to conduct business over the Internet/Intranet.

High Speed Connection	Roanoke has a high capacity DS3 connection to the Internet
Web Server	Roanoke has several public web servers for a variety of e-government applications, GIS, the content management system, and employee portals. Security on each server and each application is handled individually; employee portal access is limited to city employees and requires authentication (Lotus Notes).
Content Management	you@web Lotus Notes enterprise system
SSL certificates	Verisign
Application Servers	Websphere Domino IIS
Web Access Control	Access control for internal use is controlled via Web Inspector software.
Interfaces	• HostPublisher (Websphere) to access Enterprise Server VSAM databases and AS/400 DB/400 databases. • XML
Data access	• MS-SQL (JDBC connection) • MS-Access (ODBC connections) • Lotus Notes (DIIOP) • HostPublisher (ZOS & AS/400) • DB/400 • WebLink (Laserfiche Imaging system interface)
Web Development	• Lotus Notes • Java • Javascript • HTML, DHTML • XML • IIS • VB.Net • ASP • CGI

	• Flash MX & MX 2004

Security Architecture

The security architecture defines the standards and policies required to protect technology and information assets of the city and to ensure confidentiality of information residing on the enterprise infrastructure. With the emergence of e-government, wireless/mobile computing, and other technology advances, the security architecture model is continually evolving in a dynamic environment. E-government has opened a new era of technology opportunities and requires solid security architecture for operating in a secure and protected manner.

Detailed information regarding Roanoke's technology security policies and guidelines can be found in the Administrative Procedures manual on the Employee portal.

Authentication	Lotus Notes Websphere
External Access	Firewall – Cisco PIX VPN FTP
Certificates (SSL)	Verisign
Internet servers	Reside on DMZ
Application Servers	Located inside firewall
Wireless	Cisco encrypted
Security systems	Enterprise server – RACF

Physical Architecture

The physical architecture consists of the wiring, circuits and other various components that manage the flow of data throughout the city's network. Currently, the city's WAN covers over 50 locations connected through a wide variety of communications solutions:

Wiring	CAT5 Ethernet 100Mbps Fiber – Single mode MAN
Wireless	Cisco Aironet Access Point 1100 Nortel WLAN Access Point 2230 Nortel Security Switch 2270 – 2GE *The downtown wifi project is hosted by the Higher Ed Center and is separate from the Roanoke network infrastructure with the exception of the Main City Library.
Switches	Nortel Networks BPS and 6000 switches
VPN Connectivity	Nortel Networks Contivity over leased cable and voice circuits

Telecommunications Architecture

The City migrated from a Completely Centrex telephone system to a 15 site Nortel PBX system in 2003. This system is managed by the Telecommunication Division of DoT. The Nortel PBX system consists of 1,264 telephones and covers all City Departments and the Water Authority. Fourteen of these sites are serviced by the Cities SONET fiber loop and the others are connected by fiber,T1s or copper. The Telecommunication Division uses OTM (Opivity Telephone Manager) to make moves, Adds and changes to the system. There are approximately 350 Centrex users remaining in our telephone system. It was not economically feasible to add these to the PBX.

VoiP is being used at the Radio Shop on 5 telephones on a trail bases.

Radio Network

In 1998 the City migrated from a simplex VHF radio system to join Roanoke County and form a four Site Analog 800MHz Simulast Trunking Radio System. This Radio System supports over 1100 users In the City including Police, Fire, rescue, Public Works and the Water Authority. The system allows complete interoperability with the County.

In 2002 Roanoke County joined the City's Mobile Computer System to form a Four Site 800MHz Mobile Computer System. This system has approximately 170 users including 20 used by the Virginia State Police. All users can run DMV checks from their mobile unit and the City Police can fill out their reports while mobile and down load them to the Network at wireless hot spots.

In 2004, the city is undergoing a comprehensive study of the telecommunications architecture including support, disaster recovery, and future strategic directions for both radio and voice communications.